

commenced to back to NNE. and set in in good earnest; at 2 p. m. took in foresail and reefed mainsail; at 4 p. m., wind N. heavy—12 midnight, NW. wind with heavy sea." On this chart will also be found the probable course of two storms encountered by the S. S. Gaelic over the North Pacific Ocean on December 22nd and 26th, 1879, respectively. During the storm of the 26th the barometer fell to 29.15, the gale commenced at SE. and veered to SW. and N., attaining a force of 11 (Beaufort) with a mountainous sea.

Chart No. V shows by isobaric and isothermal lines, the mean pressure and temperature, and, by small arrows, the prevailing direction of the wind, at 7:25 a. m., Washington mean time, over the northern and portions of the southern hemisphere for the month of August, 1878. The barometer observations have been corrected for temperature and reduced to sea level. At stations lying outside the area included within the lines and for those in the southern hemisphere the means are shown by figures indicating the temperature in degrees, Fahr., and the pressure in English inches. As compared with the preceding month (July, 1878) the pressure over the ocean-areas, (especially over the eastern portions) is decidedly lower: thus at St. Michael's and St. Paul's Island, Behring's Sea, the mean pressure fell from 29.78 and 29.82 to 29.69 and 29.78 while the means of the observations between 30 and 50 N. are also lower. Over the Atlantic the region of 30.30 entirely disappeared, the area of 30.10 which during July covered the greater part of the North Atlantic and the northeastern margin of which extended to Ireland and Land's End, diminished so that in August it was included between the parallels of 20 and 40 N. The area of low pressure over the northern portion of the North Atlantic, which during July was probably central to the north of Godthaab and Styk-kisholm, is found during August central between the parallels of 50 and 60 N., and probably about 20 W. The isobar 29.80 includes the greater part of the ocean between 48 and 51 N., and 30 and 10 W., the British Isles, the North Sea and portions of Denmark, Sweden and Norway. Over Western Europe and Asia the means show a general increase of pressure, and during the latter part of the month (August, 1878) northerly winds set in along the coast of China. The monthly rainfalls reported by the co-operating stations in Hindostan show an increase in amount at all stations, except Bombay, Poona, Allahabad and Chittagong; increase, 16.13 inches at Deesa and 6.27 at Goalpara. At Bombay the decrease is 28.15 inches.

On Chart No. VI are traced the paths of thirty of the principal storm-areas, which traversed the northern hemisphere during the month of August 1878. The general distribution of these tracks corresponds to that of low pressures, as shown on chart No. V. Among the most notable storms of the month the following may be mentioned. No. I, typhoon along the coast of China, from July 30th to August 1st; the lowest pressures were experienced at Nagasaki on the 2nd, with S. to WSW. winds, and at Tokio on the 3rd, with SSW. and SW. winds. At these stations the greatest daily velocities of the month were recorded during the passage of this area, namely, Nagasaki, on the 2nd, 506 miles and Tokio, on the 3rd, 260 miles; at the former station on the 1st a rainfall of 7.45 inches was recorded with SE. and S. winds. On the 5th, S. S. *Peking* in 35 N. 157 W. reports barometer 29.70, wind SSW., 41 miles, veering on the 6th, to N. by W. 25 miles. No. IX was accompanied by SW. gales along the coast of Alaska from the 1st to the 4th, the maximum velocity of the month, SW. 74 miles per hour, being registered at St. Michael's on the 2nd. No. XII, described in the *Monthly Weather Review* for August, 1878, as low area No. IV, was accompanied in its passage over the eastern portion of the United States by exceedingly severe thunder-storms, and by a destructive tornado at Wallingford, Conn. No. XVI, described as low area No. VIII, in the *Review* for August, 1878, which developed into a hurricane over the western portion of the Gulf of Mexico on the 16th and 17th. No. XVII, (No. VI, August *Review*), accompanied by severe gales on the 19th and 20th, from 35 N. to the Gulf of St. Lawrence, and between the meridians of 55 and 61 W. No. XX was quite severe in the region of Hudson's Bay and Davis Straits, a vessel being driven ashore on the west coast of Hudson Bay during a heavy NE. gale on the 23rd, and on the 25th meteorological observations on board the *Schr. Florence* in Davis Straits were omitted on account of "heavy storm." No. XXI over the East Atlantic on the 18th and 19th. No. XXV over the North Pacific on the 25th. No. XXVI, which progressed very slowly as a hurricane of great severity from the Bahamas to the Bermudas; it was encountered on the 25th in 26 N. 76 W., on the 26th, 29 N. 71 W., 27th, in 31 N. 71 W., on the 28th it passed over the Bermudas and on the 29th was encountered in 36° N., 55° W.

TEMPERATURE OF THE AIR.

The mean temperatures for March, 1880, are shown by the isothermal lines upon chart No. II. As is shown by the table of average temperatures on that chart the temperature was above the normal in all districts from the Mississippi valley eastward to the Atlantic ocean, except New England, St. Lawrence valley and Canadian maritime stations. In the Plateau and Rocky mountain districts, Missouri and Red River of the North valleys and on the Pacific coast the temperature was below the normal. The greatest excess of temperature prevailed in Florida, and the greatest deficiencies are reported from the Canadian maritime stations, 5°.9 below; Red River of the North valley, 5°.1 below; Portland, Or., 6°.6 below; North Rocky Mountain slope, 7°.3 below. The temperature has been unusually low from the northern half of the Pacific coast region eastward to the Red River of the North valley. The table of comparative temperatures for the several districts is printed on the right side of chart No. II.

Maximum Temperatures.—Maine: 56° at Portland. New Hampshire: 37° at Mt. Washington and 57° at *Dunbarton. Vermont: 53° at Burlington and 63° at *Charlotte. Massachusetts: 72° at Boston. Rhode Island: 60° at Newport. Connecticut: 69° at New Haven. New York: 70° at New York and 58° at Oswego. New Jersey: 73° at Barnegat; 74° at *Trenton, *Vineland and *New Lisbon. Pennsylvania: 75°

at Philadelphia and 69° at *Catawissa. *Delaware*: 73° at Delaware Breakwater. *Maryland*: 76° at Baltimore and *Emmitsburg. *District of Columbia*: 79° at Washington. *Virginia*: 81° at Norfolk and 77° at Lynchburg. *West Virginia*: 71° at Morgantown. *North Carolina*: 82° at Wilmington, 79° at Charlotte and 83° at *Weldon. *South Carolina*: 80° at Charleston and 82° at *Aiken. *Georgia*: 85° at Savannah and 84° at Augusta. *Florida*: 87° at Key West, 79° at Pensacola and 93° at *Houston. *Alabama*: 85° at Montgomery. *Mississippi*: 85° at Vicksburg. *Louisiana*: 81° at New Orleans and 85° at *Point Pleasant. *Texas*: 99° at Eagle Pass, 97° at Rio Grande City, 87° at Stockton, 84° at Denison, 86° at Fort Elliott 80° at Indianola and 104° at *Ft. Ringgold. *Ohio*: 70° at Cincinnati and 63° at Cleveland. *Kentucky*: 77° at Louisville. *Tennessee*: 76° at Memphis and Knoxville. *Arkansas*: 78° at Little Rock and *Mount Ida. *Michigan*: 57° at Port Huron and 48° at Escanaba. *Indiana*: 70° at Indianapolis and 76° at *Laconia. *Illinois*: 71° at Cairo, 60° at Chicago and 75° at *Anna. *Missouri*: 76° at St. Louis and 84° at *Corning. *Kansas*: 85° at Dodge City and *Wellington, 76° at Leavenworth. *Wisconsin*: 60° at La Crosse. *Iowa*: 80° at Des Moines and *Logan. *Nebraska*: 80° at North Platte and 79° at Omaha, 84° at *Howard. *Indian Territory*: 88° at Ft. Sill and 78° at Ft. Gibson. *Minnesota*: 62° at St. Paul and 55° at Duluth, 54° at Breckenridge. *Dakota*: 68° at Ft. Buford and Yankton, 45° at Pembina and 72° at *Olivet and *Morrison. *Colorado*: 73° at Denver and 25° at Pike's Peak, 70° at *Ft. Collins. *New Mexico*: 81° at La Mesilla and 63° at Santa Fe. *Wyoming*: 69° at Cheyenne. *Utah*: 62° at Salt Lake City and 51° at *Coalville. *Nevada*: 84° at Tulasco Wells, 65° at Winnemucca and 56° at Pioche. *Arizona*: 87° at Tucson, 78° at Ft. Verde and 72° at Ft. Apache. *Idaho*: 64° at Boise City. *Montana*: 72° at Ft. Keogh and 68° at Ft. Benton. *California*: 88° at *Livermore, 78° at Red Bluff, 69° at San Diego. *Oregon*: 58° at Portland and 69° at Umatilla. *Washington Territory*: 58° at Olympia.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Minimum Temperatures.—*Maine*: —1° at Eastport and —5° at *Orono. *New Hampshire*: —13° at Mt. Washington and —1° at *Dunbarton. *Vermont*: —1° at Burlington and —4° at *Lunenburg and *Newport. *Massachusetts*: 12° at Boston and Springfield, and 2° at *South Lee. *Rhode Island*: 14° at Newport. *Connecticut*: 12° at New Haven and 10° at *Southington. *New York*: 16° at New York and 8° at Oswego, 1° at *Plattsburg Barracks and —2° at *Madison Barracks. *New Jersey*: 18° at Barnegat and Atlantic City, 13° at *Newark. *Pennsylvania*: 18° at Pittsburgh and 6° at *Franklin. *Delaware*: 25° at Delaware Breakwater and 22° at *Dover. *Maryland*: 22° at Baltimore and 13° at *Owings' Mills. *District of Columbia*: 21° at Washington. *Virginia*: 27° at Norfolk, 30° at Lynchburg and 18° at *Mt. Solon. *West Virginia*: 20° at Morgantown and *Helvetia. *North Carolina*: 33° at Charlotte and 31° at Kittyhawk, 25° at *Franklin and *Highlands. *South Carolina*: 40° at Charleston and 37° at *Aiken. *Georgia*: 43° at Savannah, 35° at Augusta and 34° at *Gainesville, 32° at *McPherson Barracks. *Florida*: 63° at Key West and 40° at Pensacola, 36° at *Fort Barrancas. *Alabama*: 35° at Mobile and Montgomery, and 34° at *Green Springs. *Mississippi*: 35° at Vicksburg and 34° at *Fayette. *Louisiana*: 42° at New Orleans and 34° at Shreveport, 38° at *Point Pleasant. *Texas*: 32° at Indianola and Rio Grande City, 24° at Eagle Pass, 15° at Stockton, 14° at Denison and —2° at Fort Elliott. *Ohio*: 28° at Cincinnati and 15° at Cleveland, 8° at *North Lewisburg. *Kentucky*: 27° at Louisville. *Tennessee*: 29° at Nashville and 28° at *Clarksville and *Ashwood. *Arkansas*: 32° at Little Rock and 28° at *Mt. Ida. *Michigan*: —16° at Escanaba, —8° at Alpena, 11° at Detroit and Port Huron. *Indiana*: 21° at Indianapolis and 18° at *Wabash. *Illinois*: 28° at Cairo, 19° at Chicago and 10° at *Anna. *Missouri*: 23° at St. Louis and —4° at *Oregon. *Kansas*: —8° at Dodge City and 4° at Leavenworth, —4° at *Creswell. *Wisconsin*: —1° at La Crosse, 10° at Milwaukee and —12° at *Neillsville. *Iowa*: —3° at Des Moines, —21° at *Vail, 19° at *Glenwood and 18° at *Logan. *Nebraska*: —21° at North Platte and —7° at Omaha. *Indian Territory*: 10° at Fort Sill. *Minnesota*: —30° at Breckenridge, —18° at Duluth and —7° at St. Paul. *Dakota*: —31° at Pembina, —23° at Forts Buford and Stevenson and —16° at Yankton. *Colorado*: —10° at Denver, —14° at Pike's Peak and —12° at *Fort Collins. *New Mexico*: 24° at La Mesilla and 0° at Santa Fe. *Wyoming*: —17° at Cheyenne and —42° at *Ft. Fred Steele, and —34° at *Ft. Fetterman. *Utah*: 5° at Salt Lake City and —20° at *Coalville. *Nevada*: 2° at Winnemucca and 5° at Pioche, 0° at *Carson City and 2° at *Tulasco Wells. *Arizona*: 30° at Florence and Phoenix, 11° at Prescott and 18° at Ft. Apache. *Idaho*: 10° at Boise City. *Montana*: —24° at Fort Keogh, —18° at Fort Benton and —22° at Virginia City. *California*: 19° at Campo, 39° at San Diego and San Francisco, 31° at Visalia, 28° at Red Bluff, 15° at *Ft. Bidwell and —10° at *Truckee. *Oregon*: 12° at Umatilla, 19° at Roseburg, 25° at Portland and —4° at *Ft. Harney. *Washington Territory*: 23° at Olympia.

Those marked with a star (*) are reported by U. S. Army Post Surgeons or Voluntary Observers.

Ranges of Temperatures at Signal Service Stations.—The monthly ranges will appear from an examination of the maxima and minima just given. The greatest daily ranges vary in New England from 21° at Woods Holl, 27° at Springfield, Mass., to 51° at Eastport and 42° on Mt. Washington. For Middle Atlantic States from 23° at Sandy Hook and New York, 25° at Albany, to 32° at Norfolk. South Atlantic States, 16° at Portsmouth, N. C., 26° at Atlanta, 28° at Jacksonville to 32° at Augusta. East Gulf States, 13° at Key West, 21° at Cedar Keys to 26° at Pensacola and 33° at Montgomery. West Gulf States, 19° at Galveston, 25° at Little Rock, 27° at Vicksburg to 37° at Corsicana. Tennessee and Ohio valley, 22° at Cairo to 29° at Morgantown and Nashville, and 36° at Knoxville. Lower Lake region, 24° at Buffalo to 27° at Detroit and Rochester, and 30° at Oswego. Upper Lake region, 26° at Chicago, 32° at Port Huron, to 35° at Duluth and 50° at Alpena. Upper Mississippi valley, 24° at Springfield, Ill., 27° at Davenport to 36° at St. Paul and 38° at Des Moines. Red River of the North valley, 35° at Pembina

and 43° at Breckenridge. Missouri valley, 32° at Leavenworth, 39° at Yankton and Bismarck to 43° at Ft. Buford. Texas, 30° at Denison and Rio Grande City to 45° at Concho. Eastern Rocky Mountain slope, 35° at Ft. Gibson to 44° at Dodge City, 49° at Ft. Elliott and 52° at North Platte. Middle Plateau District, 29° at Pioche, 32° at Boise City and Salt Lake City, to 42° at Winnemucca. California, 20° at San Francisco, 30° at Sacramento and Visalia to 33° at Los Angeles and 37° at Red Bluff.

Frost—has generally prevailed to the 31st along the entire Rocky Mountain Slope southward to latitude 35° and eastward to the Atlantic ocean; southward of that parallel the following cases are reported: Near Mayport, Fla., light on the 30th; Savannah, Ga., light on the 30th and 31st, slightly injuring plants in low places; Augusta, Ga., 25th, 26th, 30th, 31st, heavy frost, damaging gardens; Clarksville, Tex., 14th to 17th, materially injuring corn, fruit and garden vegetables; 14th to 17th, New Ulm and Austin, Tex.; Mesquite, 13th to 15th, killed corn planted in February, destroyed all early fruits; Melissa, Tex., 14th, 15th, gardens injured; Aiken, S. C., 31st; Mississippi, 17th, near Fayette; Quitman, Ga., 31st, light on low grounds; Gainesville, Ga., 17th, 23rd, 24th, and on 30th, 31st, killing beans and tomato tops; Houston, Fla., 29th, 30th; Green Spring, Ala., 17th, 30th. On the Pacific coast frost was frequent to end of month in the northern half—in California it has been reported as follows: Salinas City, frequent; Mt. St. Helena, 4th, (8th, hardy orange trees killed to the ground, other trees seriously injured;) Lompoc, frequent. Pt. San José, 13th, 15th; Caliente, 25th, freezing Eucalypti trees; at Charleston, S. C., 30th, slightly injuring garden vegetables; at Charlotte, N. C., 31st, injuring fruit trees and vegetables; Atlanta, Ga., 17th, 29th; Texas, Fredericksburg, 10th to 19th, killing all vegetables and injuring wheat badly; Boerne, 14th to 16th, very severe, doing considerable damage to vegetation; San Antonio, 16th, seriously damaging fruit and crops; Uvalde, 15th; Brackettsville, 16th, killing all vegetables; Pilot Point, 15th, damaging vegetables and fruit; Concho, 16th; Castroville, 13th, 16th, injuring fruit and crops; Montgomery, Ala., 29th, 30th, in country near; Little Rock, Ark., 17th; Indianola, Tex., 15th, 16th.

Ice—was general north of parallel 37°. In North Carolina, at Weldon, 23rd; Lenoir, 25th, 31st; Statesville, 25th, 30th; Charlotte, 30th; in Tennessee, at Ashwood, 25th; Texas, Melissa, 14th, 15th; Austin, 14th to 17th; Castroville, 15th; San Antonio, 16th, $\frac{1}{2}$ inch thick. California: Pt. San José, 13th; San Francisco, 4th, sidewalks frozen, 12th, 29th; Sacramento, 15th; Los Angeles, 16th. Georgia: Augusta, 31st.

PRECIPITATION.

The general distribution of the rain-fall, including melted snow, for March, 1880, is illustrated upon chart No. III, as accurately as possible from about 500 reports. This chart shows the area of maximum precipitation over Tennessee, northern Mississippi, Alabama and northwestern Georgia. The minimum precipitation in amounts less than one inch fell over the Plateau, the Rocky Mountain districts, a portion of the central Missouri and the greater part of the Missouri valley. In the left-hand corner of the same chart will be found a table of average rain-falls for the month of March. Large excesses over the average for the present month are reported from the Gulf States and Tennessee, and a slight excess from the Middle Atlantic States, and the South Pacific coast region. From all other districts differences are reported, being small except in New England, Lower Missouri valley, the North and Middle Pacific coast regions.

Unusually Heavy Rains.—2nd, Denison, Tex., 2.01 inches in 10 hours and 20 minutes; Messina, Tex., 2.00 in. in 14 hours. 3rd, Memphis, 1.28 in. in 8 hours; Little Rock, Ark., 2.15 in. in 8 hours. 3rd, Franklin, N. C., 2.60 in. in 22 hours; Chattanooga, Tenn., 2.17 in. in 16 hours. 4th, Highlands, N. C., 2.70 in. in 21 hours; Duluth, 0.98 in. (melted snow) in 4 hours and 15 minutes. 7th, Austin, Tenn., 2.18 in. in 11 hours. 8th, New Orleans, 2.81 in. in 8 hours; Galveston, 1.24 in. in 8 hours; Cape Henry, Va., 1.02 in. in 8 hours; Fayette, Miss., 2.80 in. 9th, Gainesville, Ga., 8th, 9th, 2.65 in. in 22 hours; Mobile, 3.49 in. in 8 hours; Montgomery, 1.34 in. in 8 hours; Charlotte, N. C., 1.69 in. in 8 hours. 10th, Point Pleasant, La., 2.51 in.; Green Springs, Ala., 10th, 11th, 1.97 in. in 18 hours; Forsyth, Ga., 10th, 11th, 3.10 in. in 25 hours. 11th, Little Rock, Ark., 2.11 in. in 16 hours; Corsicana, Tex., 1.58 in. in 8 hours; Vicksburg, 10th, 11th, 2.27 in. in 16 hours; Augusta, 1.53 in. in 8 hours; Denison, Tex., 1.20 in. in 8 hours; Point Pleasant, La., 3.00 in.; Mt. Ida, Ark., 3.20 in. in 22 hours; New Ulm, Tex., 10th, 11th, 3.75 in. Atlanta, 1.02 inches in 8 hours; Melissa, Tex., 2.00 in. in 9 hours; 11th, 12th, Statesville, N. C., 3.10 in. in 18 hours; Ashwood, Tenn., 2.75 in. in 24 hours. 12th, Nashville, 2.78 in. in 16 hours; Memphis, 2.75 in. in 8 hours; Atlanta, 1.13 in. in 8 hours; Austin, Tenn., 2.74 in.; Gainesville, Ga., 13th to 16th, 5.72 in. in 82 hours. 13th, Montgomery, 1.52 in. in 8 hours; Franklin, N. C., 14th to 16th 4.10 in. 14th, Ft. Barrancas, Fla., 2.48 in. in 9 hours. 15th, Chattanooga, 1.83 in. in 8 hours; Knoxville, 1.05 in. in 8 hours; Vicksburg, (14th, 15th,) 4.63 in.; Pensacola, Fla., 1.25 in. in 7 hours; Point Pleasant, La., (14th, 15th,) 5.01 in. in 37 hours; Austin, Tenn., 2.80 in. 16th, Highlands, N. C., 2.55 in.; Montgomery, Ala., 1.67 in. in 6 hours; Pensacola, Fla., 1.64 in. in 6 hours and 20 minutes; Green Springs, Ala., 14th to 16th, 4.95 in.; Ft. Barrancas, Fla., 2.09 in. in 10 hours; Atlanta, 1.32 in. in 8 hours. 18th, Point Pleasant, La., 2.00 in. in 8 hours; Shreveport, 1.40 in. in 6 hours; Fayette, Miss., 2.10 in. 19th, Forsyth, Ga., 2.90 in. in 8 hours; Augusta, 1.71 in. in 6 hours; Smithville, 1.22 in. in 8 hours; Chincoteague, Va., 1.43 in. in 8 hours; Cape Lookout, N. C., 1.73 in. in 8 hours; Portsmouth, N. C., 1.82 in. in 6 and one-half hours. 21st, New Ulm, Texas, 2.50 in. in 12 hours; Galveston, 1.70 in. in 8 hours; Castroville, Tex., 1.18 in. in 14 hours. 26th, New Corydon, Ind., 26th, 27th, 2.29 in. in 17 hours; Fort Leavenworth, Kan., 1.60 in. in 6 and one-half hours. 27th, Cleveland, Ohio, 0.50 in. in 12 minutes; Detroit, 1.20 in. in 8 hours; Indianapolis, 2.27 in.; Chincoteague, Va., 1.43 in. in 8 hours; 31st, Denison, Tex., 1.10 in. in 4 hours.